

WHAT IS CLAIMED IS:

- 1 1. An imaging system for imaging a sample of interest comprising:  
2 an emitter enabled to project imaging radiation through said  
3 sample of interest, at least one of said emitter and said sample of interest  
4 being manipulable such that relative movement between said imaging  
5 radiation and said sample of interest is enabled; and  
6 a plurality of detecting modules disposed in a sparsely  
7 distributed configuration, including a first detecting module that is spaced  
8 apart from a neighboring second detecting module, said first and second  
9 detecting modules each having an array of sensors that are responsive to  
10 said imaging radiation, said detecting modules being cooperatively aligned  
11 with said emitter such that multiple said detecting modules are simultaneously  
12 irradiated by a continuous pattern of said imaging radiation, said detecting  
13 modules being cooperative with said emitter and said sample of interest for  
14 detecting regions of said sample of interest to generate series of sub-images  
15 during said relative movement between said imaging radiation and said  
16 sample of interest.
- 1 2. The imaging system of claim 1 wherein said first detecting module and  
2 said neighboring second detecting module are coupled to an integrating unit  
3 by respective first and second channels, said first channel being independent  
4 from said second channel, said integrating unit including processing circuitry  
5 for integrating said sub-images to form a composite image of said sample of  
6 interest.
- 1 3. The imaging system of claim 2 wherein said composite image includes  
2 one of a three-dimensional image and a two-dimensional slice of said three-  
3 dimensional image.
- 1 4. The imaging system of claim 1 wherein said detecting modules each  
2 include a substrate having a physically discrete array of sensors.

6. The imaging system of claim 5 wherein at least one of said detecting modules is configured to detect a plurality of successive said sub-images during said relative movement, said successive sub-images including a first sub-image having overlapping characteristics with a second sub-image.

8. The imaging system of claim 1 wherein said emitter is an x-ray tube for projecting x-ray radiation, said emitter and said detecting module being on opposite sides of said sample of interest.

-17-

11. The x-ray imager of claim 9 wherein said distance is at least equal to said cross-sectional distance of said two-dimensional pattern, said sensor arrays being substantially identical.

12. The x-ray imager of claim 9 wherein said substrate is mounted on a detector support assembly, said detector support assembly including a supporting substrate on which said sensor arrays are individually mounted.

13. The x-ray imager of claim 9 further comprising a controller for sequencing said relative displacement to generate said time series of sub-images and an integrator for computationally combining said sub-images to form one of a three-dimensional image and a two-dimensional slice of said object.

14. The x-ray imager of claim 9 further comprising an assembly for providing said relative displacement such that manipulation of said object is in a first direction and manipulation of said x-ray radiation from said source is in a second direction, said first direction being substantially perpendicular to said second direction.

15. The x-ray imager of claim 9 further comprising an assembly for providing said relative displacement at uniform velocity.

16. The x-ray imager of claim 9 wherein said object is a printed circuit board (PCB).

18. The method of claim 17 wherein said step of acquiring includes collecting a sequence of sub-images corresponding to overlapping regions of said sample of interest by at least one of said area detectors during said relative movement, said step of processing including integrating said sequence of sub-images to generate said image.

19. The method of claim 18 wherein said step of collecting includes projecting at least one pulse of said x-ray radiation onto said sample for each of said overlapping regions.

20. The method of claim 17 wherein said step of acquiring includes associating each of said sub-images with axial direction information and axial position information of a pulse that was used to form said sub-image.

21. The method of claim 17 wherein said step of processing said sub-images includes forming one of a three-dimensional image and a two-dimensional view of said three-dimensional image of said sample of interest.

22. The method of claim 17 wherein said step of exposing said plurality of area detectors includes providing dedicated electrical connection between each of said area detectors and common processing circuitry so as to enable electrical isolation among said area detectors.

23. The method of claim 18 wherein said step of integrating includes computationally combining said sequence of sub-images after at least one of:

- a. scaling,
- b. resampling to change magnification,
- c. offsetting spatially to match regions, and
- d. adjusting to reflect an absorption of said radiation by said sample of interest.

24. The method of claim 23 wherein said step of combining includes algebraically adding said sub-images of said sequence.

25. The method of claim 23 wherein said step of combining includes one of unfiltered backprojecting and filtered backprojecting.

26. The method of claim 23 wherein said step of combining includes selecting said sub-images having minimum artifacts.